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191. Proposed by J. EDWARD SANDERS, Reinersville, Ohio.

Two random lines cut a given circle. What is the chance that they intersect within the circle?

Solution by HENRY HEATON, Belfield, N. D., and the PROPOSER.

Let  $x$  = the distance of one of the lines from the center of the circle, and  $\theta$  = the angle between the lines. The length of the part of the first line lying within the circle is  $2\sqrt{(a^2 - x^2)}$ . For given values of  $x$  and  $\theta$  the chance of intersection is

$$\frac{2\sin \theta \sqrt{(a^2 - x^2)}}{2a} = \frac{\sin \theta}{a} \sqrt{(a^2 - x^2)},$$

and the required chance is

$$P = \int_0^a \int_0^{4\pi} \frac{\sin \theta}{a} \sqrt{(a^2 - x^2)} dx d\theta \div \int_0^a \int_0^{4\pi} dx d\theta = \frac{2}{a\pi} \int_0^a \sqrt{(a^2 - x^2)} dx = \frac{1}{2}.$$

Also solved by G. B. M. Zerr, who gets  $\frac{1}{2}$  for the result. His solution will be published in the next issue of the MONTHLY.

## PROBLEMS FOR SOLUTION.

### ALGEBRA.

293. Proposed by C. E. WHITE, Vanderbilt University, Nashville, Tenn.

Prove by mathematical induction that  $\frac{(x-a)^{m-1}}{(m-1)!} f^{m-1}(a) + \frac{(x-a)^{m-2}}{(m-2)!} f^{m-2}(a) + \dots + \frac{(x-a)^2}{2!} f''(a) + (x-a)f'(a) + f(a)$  will be the remainder when  $f(x)$  is divided by  $(x-a)^m$ .

294. Proposed by O. L. CALLECOT, Gettysburg, S. Dak.

Find the limit of  $\sum_{n=1}^{\infty} \frac{2(n^2 + 3n + 3)}{n(n+1)(n+2)(n+3)}$ .

### GEOMETRY.

326. Proposed by L. E. NEWCOMB, Los Gatos, Calif.

The circle  $C$  of radius  $pR$  encloses the circles  $A_1B_1$  of radii  $R$  and  $(p-1)R$ , respectively; the circle  $B_1$  is tangent to  $A_1B_1C_1$ ; the circle  $B_2$  is tangent to  $AB_1C$ ; the circle  $B_3$  to  $AB_2C$ , ...,  $B_n$  to  $AB_{n-1}C$ . Find the radius of the circle  $B_n$ .